Bulletin 474

COOPERATIVE EXTENSION SERVICE • THE OHIO STATE UNIVERSITY

MEDICATED FEED ADDITIVES

A Handbook on the Safe Use of Feed Additives and Drugs for Livestock and Poultry

Glossary of Terms and Definitions

Antibiotic Form 10—A form submitted to the Food and Drug Administration for approval to manufacture (or mix into feed) certain types of medicated feeds that contain penicillin, streptomycin, bacitracin, chlortetracycline or chloramphenicol.

Authorized treatment period—That period of time or number of doses for which treatment is authorized.

Breeding Animals—Animals that are being maintained for purposes of reproduction rather than for slaughter as food.

Chickens

Broiler chickens—Chickens raised for meat purposes only.

Replacement chickens—Chickens being raised for the purpose of egg production.

Laying chickens—Chickens producing eggs for food.

Breeding chickens—Chickens producing eggs for hatching.

Coccidiostat—A drug for prevention and control of coccidiosis.

Contraindication—Any circumstance which makes any particular treatment undesirable or harmful.

Dosage—A measure of the quantity of drug to be given. It is often expressed as quantity of drug per pound of body weight per day or as quantity of drug per animal per day. This term and "Dose" are often used interchangeably.

Dose—A quantity of drug given one time. A single treatment.

Drench—A substance in a liquid form that is administered directly into the mouth.

Feed

Complete feed—An article intended to be administered as the sole ration to an animal.

Feed additive supplement—An article for the diet of an animal which contains one or more food additive chemicals, and is intended to be:

a) Further diluted and mixed to produce a complete feed; or
b) Fed undiluted as a supplement to other rations; or
c) Offered free choice with other parts of the ration separately available.

Feed additive concentrate—An article **intended to be further diluted** to produce a complete feed or feed additive supplement so that from 100 to 1000 pounds of concentrate must be diluted to produce 1 ton of a complete feed.

Feed additive premix—An article that **must be diluted** for safe use in a feed additive concentrate, a feed additive supplement or a complete feed so that up to 100 pounds of premix must be diluted to produce 1 ton of a complete feed.

Food additive—All substances not exempted by law the intended use of which may reasonably be expected to result, directly or indirectly, either in their becoming a component of food or otherwise affecting the characteristics of food.

Gram (g)—A unit of weight in the metric system. One pound contains 453.6 grams.

Histomonastat—A drug for prevention and control of histomoniasis (blackhead).

Kilogram (kg)—A unit of weight in the metric system. A kilogram is 1000 grams and is equal to 2.2 pounds.

Limitations—Delineates the species, sex and age of animal for which a specific quantity of a feed additive is authorized. Each approved additive is authorized by species. There may not be limitations, in some instances, for age or sex differences.

Milligram (mg)—A unit of weight in the metric system. A milligram is 1/1000 of a gram or 0.001 gram.

New Drug—Any drug or combination of drugs that is not considered by qualified scientists to have been used for a sufficient period of time to establish that it is unquestionably safe and effective for the purpose for which it is to be used.

NDA—New Drug Application. A form submitted to the Food and Drug Administration of the U. S. Dept. of Health, Education, and Welfare for approval to manufacture (or mix into feed) a "new drug."

Pesticides—In general use refers to all substances regulated by the Dept. of Agriculture as "economic poisons." These include insecticides (insect poisons), herbicides (weed killers), rodenticides (rat poisons), nematocides (poisons for those worms found in soil, water or plants), fungicides (for treatment of fungus diseases of seed and plants), and plant growth regulators.

P.P.M.—Parts per million, a ratio of 1:1,000,000. Example: 1 ppm of 500 tons (1,000,000 lbs) is 1 pound.

Purge—A drug used to expel fecal matter from the intestinal tract.

Ration

Starter ration (poultry)—A' complete feed administered during the first three weeks of life.

Grower ration (poultry)—A complete feed administered from three weeks of age until sexual maturity (20—25 weeks).

Finishing ration (poultry)—A complete feed administered for short periods prior to marketing.

Laying ration (poultry)—A complete feed for laying hens.

Breeding ration (poultry)—A complete feed for birds maintained for hatching egg production.

Prestarter ration (swine)—A feed administered from the time baby pigs begin to eat until they weigh approximately 12 pounds.

Starter ration (swine)—A complete feed administered to the animals as they grow in weight from approximately 10 to 50 pounds.

Grower ration (swine)—A complete feed administered to the animals as they grow in weight from approximately 30 to 125 pounds.

Finishing ration (swine)—A complete feed administered to the animals as they grow in weight from approximately 100 pounds to market weight.

Residues—Minute quantities of drugs or feed additive chemicals that may be found in crops, meat, milk, or eggs for several hours or for many days after the final application or contact with the material.

Tolerance—The maximum quantity of a chemical residue that will be permitted on raw agricultural crops, meat, milk or eggs. This quantity is expressed as parts per million (p.p.m.). At the present time, there are no tolerances for any agricultural chemicals or drugs in milk. Thus, no residues may be permitted in milk.

Vermifuge—A drug used to expel worms from the intestinal tract.

Warning statement—A specific limitation to the use of pesticides, drugs, or medicated feed to prevent economic loss to livestock or prevent adulteration of food.

Withdrawal period—That period of time during which the animal must receive a feed that does not contain the food additive, or that period of time from the final application of a pesticide or treatment with a drug before the animals can be slaughtered for food.

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MEDICATED FEED ADDITIVES

A Handbook on the Safe Use of Feed Additives and Drugs for Livestock and Poultry

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Introduction

Numerous chemicals are used in food production, processing, storage, and distribution. Some are added intentionally to impart flavor or color, to retard spoilage, or to improve nutritional value. Others may enter food unintentionally and unavoidably by application to crops in the field, from contact with packaging materials, or by treating livestock with drugs and pesticides.

At least 80 per cent of the agricultural chemicals used today were unavailable prior to 1945. At that time, the concept of feed additives was as little known to most people as were the concepts of nuclear energy. Today, the situation is markedly different. Over 1.7 million pounds of antibiotics were used in agriculture in 1961 for animal feed supplements, food preservation, and crop disease control. All other human and veterinary use totaled 2.7 million pounds. Thus, more than half of all antibiotics produced in 1961 were used by farmers or food processors.

In 1963, the value of drugs sold for use in animals was over 100 million dollars. Over half of this amount was sold for use in the midwestern and north central states.

It is estimated that over 80 per cent of all swine and beef cattle receive drugs in their feed and over 90 per cent of all poultry receive medicated feed. With mass medication of food producing animals or poultry, we have been faced with new problems in consumer food protection.

To protect the consumer from possible harmful effects from misuse of chemicals, it has become necessary to regulate the use of chemicals in food production and processing. Only authorized additives, including some pesticides, are permitted in food. The presence of unauthorized contaminants will cause the food to be considered as adulterated, and it may be condemned to prevent marketing.

The United States Department of Agriculture through the Meat Inspection Division and Poultry Inspection Division is responsible for assuring that unauthorized chemical residues are not present in meat and poultry. The Food and Drug Administration of the United States Department of Health, Education and Welfare inspects other food for adulteration and establishes the tolerances or the maximum quantity of a chemical that can be present in food.

Many of the chemicals used in agriculture can become components of food. Insecticides may remain on the surface of treated crops or may be absorbed through the surface of the foliage and incorporated into the growing cells. Insecticides in the soil may also enter the plant. Similarly, insecticides applied on the skin of livestock may be absorbed into the body and may either be secreted in milk or may remain in the carcass. For these same reasons, forage crops and other feeds fed to livestock must not contain high levels of pesticide residues.

Drugs added to feed for growth promotion or disease control may also become incorporated into meat or milk. Incorrect injection of prophylactic drugs such as iron-dextran may not only result in chemical residues but may produce discoloration or scar tissue which will result in condemnation of the affected portion of the carcass at slaughter. In swine, the area most frequently involved—the ham—is also an economically valuable portion.

Dairymen are well aware of the necessity for withholding milk from market when antibiotic udder infusions are used. However, it must be emphasized that similar requirements exist if the cow is injected intravenously or intramuscularly with antibiotics.

Eggs may be considered to be similar to milk in consideration of the use of chemicals and resulting residues. Thus, many substances may not be used for laying hens since these chemicals may readily enter the egg.

Many drugs or chemicals are useful because they are widely distributed in tissues (example—antibiotics) or because they have long lasting effects (examples—DDT, Stilbestrol implants). These same useful properties often present special problems in our attempts to keep them out of food for human consumption. DDT has persistent effects because it is slowly broken down to inactive chemicals. For this reason, it cannot be used where there are dairy cattle for it has been impossible to keep DDT from indirectly entering cattle in feed or by skin contact. It accumulates in the body fat and is slowly excreted in the milk. In non-lactating cattle, DDT remains stored in the animal until freshening and then enters milk in the butterfat.

It can be seen from the preceding discussion that the use of chemicals in food producing animals or

their feed presents many complexities. The livestock producer or poultryman must be aware of these in the production of wholesome meat, milk, or eggs. This manual is intended to present the basis for the laws and regulations concerning the use of feed additives and prophylactic drugs and to present guidelines for the approved use of most of these chemical substances.

Premarketing Approval for Use of New Drugs or Medicated Feed Additives

In general, any chemical that has no historical use as a food nutrient and is used to diagnose, prevent or treat a disease or to otherwise affect a structure or function of the body is considered to be a drug. Any drug or combination of drugs that is not considered by qualified scientists to have been used for a sufficient period of time to establish that it is unquestionably safe and effective for the purpose for which it is to be used is considered to be a "new drug." The Federal Food, Drug and Cosmetic Act requires that a "new drug" cannot be sold in interstate commerce until research scientists have proved that it can be used without undue hazard to animal or human health. Tests must be made to determine how long the drug remains in the tissues of animals (also milk or eggs). The withdrawal time necessary to eliminate residues of the drug from the animal or animal products can then be established.

Anyone who intends to mix a "new drug" into livestock feed, including retail feed mills or farmers, must register as a manufacturer and obtain approval to mix each "new drug" from the Food and Drug Administration. A list of those chemicals that require an approved New Drug Application or Antibiotic Form 10 may be seen in Table 5.

Drugs added to food or livestock feed may also come under consideration as "Food Additives." Food Additives are defined by regulation as any substance which may result, directly or indirectly, in its becoming a component of food. This includes both human and animal food.

Many drugs have been widely used for a sufficient period of time to establish that they can be used safely and that they do produce the desired effects. These drugs are usually considered to be "old drugs." That is, they can be mixed into feed without prior approval of the Food and Drug Administration as long as they are mixed and used in strict accordance with the directions on the label. If the label states that the drug is for drinking water, it should not be added to the feed. On the other hand, if the label states that the drug is for feed, it should not be added to drinking water. Accurate measuring and mixing are essential to assure that all animals receive the proper amount of drug.

Safe Use of Feed Additives

The tables of this publication will list for each species the major chemicals that are presently marketed as feed additives or prophylactic drugs for use by livestock producers and poultrymen. The chemicals will be identified by common name and the measures necessary to prevent illegal residues in food from these animals will be indicated.

This information should be considered **prior** to purchasing pesticides or feed additives so that requirements for drug withdrawal or holding animals prior to slaughter will not disrupt marketing plans. As an example, it would be unwise to feed the insecticide, ronnel, as a 0.6 per cent feed concentrate to feed lot cattle for grub control if they were within a few weeks of marketing since animals treated with this material cannot be marketed for 60 days.

Keep Accurate Records

A record of chemicals used in or on livestock, poultry, and their housing will serve several purposes: (1) it will help to evaluate the effectiveness of the materials used; (2) the record will indicate how long milk must not be marketed from treated cows or what is the earliest date that animals can be marketed after feeding a medicated ration, and (3) if excessive residues are suspected in animals, milk, or eggs, a record will support proper use. The Chemical Use Record illustrated on the opposite page may be obtained from your county extension agent.

Read The Label

All medicated feed must be appropriately labelled with the type and quantity of drug ingredients, directions for use, and precautions and warning statements to prevent illegal drug residues which are prohibited by federal law. Carefully read all feed labels and follow directions completely. Bulk feed is labelled on the invoice and a placard containing this information on use and warning statements should be posted conspicuously on the appropriate feed storage bin.

Observe Warning Statements

Where more than one chemical is approved for use in the same feed, the limitations for use, withdrawal times and warning statements for each drug ingredient will apply. Since precautions are based on the sum of those required for each ingredient, combinations of drugs have not been included in this publication. This will simplify the use of this guide and should minimize the effects of frequent changes due to newly approved combinations. An example of how requirements for combinations are considered may be illustrated as follows: Zoalene may be used in chickens grown for meat purposes only to prevent coccidiosis. Arsanilic acid may be used in chickens

Address ..... Year .....

Producer's Name.....

CHEMICAL USE RECORD

Dairy Animals, Livestock, Poultry, and Animal Housing

This form provides a simple method for recording the use of pesticides, feed additives, or drugs in livestock or animal housing. This information is necessary in order to establish the proper time interval between the last treatment and the earliest date that meat, milk, or eggs can be marketed. You will also find this information useful for evaluating the results of treatment.

Species of Animal or Poultry	Market Class (beef, layer broiler, dairy, etc.)	Material Used and Rate of Application or Dosage	Method of Treatment (feed, drench, spray, injection, etc.)	Date of First Treatment	Date of Final Treatment	Earliest Date that Meat, Milk or Eggs Can Be Marketed	Special Precautions

Form 7491

for growth promotion but must be withdrawn five days before slaughter. The combination of zoalene and arsanilic acid in the same feed has been approved. However, this feed must be fed only to chickens grown for meat purposes **and** must be withdrawn five days prior to slaughter.

Directions for Use of Tables

With the exception of a few drugs that are not considered to be "new drugs" of food additives, the information in these tables was taken from Part 121, Chapter 1, titled 21 Code of Federal Regulations, Subpart C—Food Additives Permitted in Feed and Drinking Water of Animals or for the Treatment of Food Producing Animals or the **Feed Additive Compendium.** A glossary of terms used in the discussion of medicated feeds and labelling is on page 2. Each table contains the drugs for a single species. The chemical name of the drug is listed under ingredient. The trade name of that chemical can be found in the list of synonyms on page 6. The quantity approved for a specific use is indicated. The limitations for use in that species will refer to limitations in age, sex, or market class of livestock. The authorized treatment periods, withdrawal period and special precautions are self explanatory. Where no information is listed under the last three headings, there are no specific limitations, precautions, or warning statements necessary for the safe use of that particular level of the ingredient. The tables do not constitute recommendations for use of any drug. Consult your veterinarian for diagnosis and selection of drugs for disease control.

References

Title 7 Code of Federal Regulations Part 362
Title 21 Code of Federal Regulations Parts 120, 121, 130, 144
Feed Additive Compendium, Miller Publishing Co., Minneapolis, Minnesota 1966

THE INFORMATION IN THE FOLLOWING TABLES IS INTENDED FOR USE AS A GUIDE. CHANGES IN THE REGULATIONS GOVERNING THE USE OF THESE DRUGS OR CHEMICALS WILL BE REFLECTED IN THE LABELING OF THE DRUG OR MEDICATED FEED. **ALWAYS READ THE LABEL AND FOLLOW DIRECTIONS COMPLETELY.**

Trade Name Synonyms

This is intended as a cross reference for those who do not recognize the chemical name of listed chemicals where the chemical name is not a part of the trade name. Any omission of trade names is otherwise unintentional.

Chemical Name	Trade Name
2- acetylamino-5-nitrothiazole	**Cyzine**
Acetyl-(para-nitrophenyl)-sulfanilamide also known as—aklomide plus 2-Chloro-4-nitro-benzamide also known as Sulfanitran	**Novastat**
2-Amino-5-nitrothiazole	**Aminozol** **Histosep-S**
Amprolium	**Amprol**
Arsanilic acid or Sodium Arsanilate	**Pro-Gen 227** **Pro-Gen 90** **Dawe's R-Sonic**
Arsenosobenzene	**Arzene**
Bacitracin	**Bio-Best**
Bacitracin Methylene Disalicylate	**Noptracin MD** **Fortacin** **Kemitracin**
Bacitracin, Zinc	**Baciferm** **Noptracin**
Bithional and Methiotriazamine	**Trithiadol**
Chlortetracycline	**Aureomycin**
Dibutylin dilaurate	**Tinostat**
Dienestrol diacetate	**Lipamone**
Diethylcarbamazine	**Cypip**
Dimetridazole	**Emtrymix**
3, 5-Dinitrobenzamide	**Tristat**
3, 5-Dinitrobenzamide plus acetyl-(paranitrophenyl)-sulfanilamide	**Unistat-2**
Erythromycin	**Gallimycin**
Ethylene Diamine Dihydriodide	**ASL Organic Iodine Compound** **Hy-Odide** **Hi-Boot** **Hoffman Bonded E-D-D Iodine Compound**
Furazolidone	**nf-180®**
Hygromycin B	**Hygromix -2, 4** **Hygromix-8**
Medroxyprogesterone acetate	**Repromix**
Nicarbazin	**Nicarb "25%"**
Nihydrazone	**Nidafur**
Nithiazide	**Hepzide "30%"**
Nitrofurazone	**nfz ® mix**
3-Nitro-4-Hyroxyphenylarsonic acid	**Dawes' 3-Nitro Powder** **Nitro Acid 100%** **Nitro-Blend**
4-Nitrophenylarsonic acid	**Histostat-50**
Nitrophenide	**Megasul**
Novobiocin	**Albamix**
Nystatin	**Mycostatin-20**
Oxytetracycline	**Terramycin**
Phthalylsulfacetamide	**TSC-80**
Reserpine	**Serpasil**
Ronnel	**Trolene FM** **Moor Man's Medicated Rid Ezy**
Stilbestrol (diethylstilbestrol)	**Stilbosol** **Dawes' DES trol** **Rumestrol** **Dibestrol**
Thiabendazole	**Thibenzole**
Tylosin P-Ureidobenzene arsonic acid	**Tylan ® premix** **Histocarb** **Carb-O-Sep**
Zoalene	**Zoamix**

Table 1. Cattle Feed Additives and Drugs

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Antibiotics (general)		Udder instillation for mastitis	Dairy cattle			Milk that has been taken from animals during treatment and for —— hours (——milkings) after the latest treatment must not be used for food
Zinc bacitracin	35-70mg/ head/day	Growth promotion	Growing cattle			
Chlortetracycline	250mg tablets	Treat bacterial scours	Calves 250mg/ 100 lb. of wt. or 250mg/newborn calf	3 days	Discontinue 24 hours before slaughter	
	0.1mg/lb. body wt./day	Prevent foot rot, reduce bacterial diarrhea	Dairy cows			
	0.5mg/lb. body wt./day	Aid in prevention of anaplasmosis	Beef cattle over 1500 lbs.		Discontinue 48 hours before slaughter	
	5mg/lb. body wt./day	Eliminate anaplasmosis carrier state	Beef cattle	Feed for 60 days	Discontinue 10 days before slaughter	
	25-70mg/ head/day	Growth promotion	Calves			
	70mg/head /day	Growth promotion	Growing cattle			
		Prevent liver abscesses	Feed lot beef cattle*			
	350mg/head /day	Prevent shipping fever and inf. pneumonia	Beef cattle*		Discontinue 48 hours before slaughter	
		Aid in prevention of anaplasmosis	Beef cattle up to 700 lbs.*		Discontinue 48 hours before slaughter	
	500mg/head /day	Aid in prevention of anaplasmosis	Beef cattle 700-1000 lbs.*		Discontinue 48 hours before slaughter	
	750mg/head /day	Aid in prevention of anaplasmosis	Beef cattle 1000-1500 lbs.*		Discontinue 48 hours before slaughter	
Diammonium phosphate	Not to exceed 2% of equivalent crude protein in total daily ration	Source of nitrogen and phosphorous	Ruminants			Use only in accordance with direction on the label
Diethyl stilbestrol	10mg/head /day	Growth promotion	Beef cattle		Discontinue 48 hours before slaughter	Not to be fed to dairy or breeding cattle
Dihydrostreptomycin plus **chlorhexidine dihydrochloride**	150mg/100 lb. body wt. plus 1500mg/100 lb. body wt.	Treat bacterial scours in calves	Calves, in tablets or suspension for oral administration	5 days	Discontinue 3 days before slaughter	

*or non-lactating dairy cattle

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Ethylene diamine dihydriodide	400-500gm/ head/day	Aid in treatment of foot rot and lumpy jaw; aid in removal of mucus from respiratory tract	Cattle	2-3 weeks		Treat with caution because of individual variation of iodides
Neomycin	35[a]	Prevent bacterial enteritis	Calves, cattle			
	70-140[a]	Treat bacterial enteritis	Calves, cattle			
	100-200mg/ gal. of milk replacer	Prevent bacterial enteritis	Calves			
	200-400mg/ gal. of milk replacer	Treat bacterial enteritis	Calves			
Oxytetracycline	0.1-5.0mg/lb. body wt/day	Prevent or treat bacterial enteritis	Calves, beef cattle			
	0.5-2.0mg/ head/day	Prevent or treat shipping fever	Beef cattle			
	10-25[a]	Growth Promotion	Calves			
	75mg/head/ day	Growth Promotion	Beef Cattle			
	75-80mg/ head/day	Reduce incidence and severity of liver abscesses	Beef Cattle over 400 lbs.			
	75-100mg/ head/day	Prevent or treat bacterial diarrhea	Dairy Cattle			
Phenothiazine	2gm/head/ day	Prevent cattle parasitism				Do not feed to lactating dairy cattle. Do not give during last 4 weeks of pregnancy
	20gm/100 lb. body wt. Do not exceed 60 gm.	Remove cattle parasites		1 treatment only		Do not exceed 60 gm. Do not use milk for food purposes for 4 days following treatment. Do not give during last 4 weeks of pregnancy
Phthalylsulfacetamide	0.1 lb./50 lb. body wt.	Treat bacterial diarrhea	Calves	3-5 days		
Progesterone combined with estradiol benzoate	200mg 20mg Subcutaneous ear implantation	Growth promotion	Steers weighing 400-1000 lbs.	1 dose	Discontinue 60 days prior to slaughter	
Promazine	0.75-1.25mg/ lb. body wt.	Tranquilizer			Discontinue 72 hours prior to slaughter	Not to be fed to lactating dairy cows
Ronnel	0.26%[c] 350mg/100 lb. body wt./day	Control grubs	0.3 lb. concentrate/100 lb. body wt/day	14 days	Heifers—60 days before calving; beef 28 days prior to slaughter	Not to be fed to dairy cows
	0.60%[c] 820mg/100lb. body wt./day	Control grubs	0.3 lb. concentrate/100 lb. body wt/day	7 days	Heifers—60 days before calving; beef 60 days prior to slaughter	Not to be fed to dairy cows

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Ronnel (continued)	5.5%[d] 6.24 grams/ 100 lb. body wt. per month	Control grubs and horn flies	0.25 lb. block or concentrate/100 lb. body wt./ month	Not less than 75 days	Heifers—21 days before calving; beef 21 days prior to slaughter	Not to be fed to dairy cows
	Note: Do not use any other organic phosphate insecticide on animals receiving ronnel					
Testosterone propionate plus estradiol benzoate	200mg 20mg Subcutaneous ear implantation	Growth promotion	Heifers weighing 400-1000 lbs.	1 dose	60 days prior to slaughter	Not for dairy heifers
Thiabendazole	3gm/100 lb. body wt.	Treat infestations of roundworms	Cattle	As a single oral dose as drench, tablet, or in feed may repeat once in 2-3 weeks	Do not treat cattle within 30 days of slaughter	Milk taken from treated animal within 96 hours (8 milkings) must not be used for food
	5gm/100 lb. body wt.	Treat severe infestations of roundworms	Cattle	As a single oral dose as drench or tablet; or in feed as a single dose or total dose divided into 3 equal parts, 1 part given on each of 3 successive days	Do not treat cattle within 30 days of slaughter	Milk taken from treated animal within 96 hours (8 milkings) must not be used for food
Medroxyprogesterone acetate	180-250mg/ head/day	Synchronize estrus and ovulation	Breeding cattle	18-30 days		

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

Table 2. Swine Feed Additives and Drugs

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Arsanilic acid or Sodium arsanilate	45-90[a]	Growth promotion			Discontinue 5 days before slaughter	
	225-360[a]	Control swine dysentery			Discontinue 5 days before slaughter	
Bacitracin	10-50[a]	Growth promotion				
	50-100[a]	Prevent bacterial enteritis				
	100[a]	Treat bacterial enteritis				
Manganese bacitracin	10-50[a]	Growth promotion				
Bacitracin methylene disalicylate	10-50[a]	Growth promotion				
	50-100[a]	Prevent bacterial enteritis				
	100[a]	Treat bacterial enteritis				
Zinc bacitracin	10-50[a]	Growth promotion				
	50-100[a]	Prevent bacterial enteritis				
	100[a]	Treat bacterial enteritis				
Cadmium anthranilate	0.044%	Removal of roundworms	Swine, as sole source of feed	3 days	Withdraw 30 days prior to slaughter	
Chlortetracycline	10-50[a]	Growth promotion				
	50-100[a]	Reduce symptoms and incidence of cervical abscesses and enteritis; maintain weight in presence of atrophic rhinitis				
	100-200[a]	Treat bacterial enteritis				
	200[a]	Reduce spread of leptospirosis	Sole medication			
	400[a]	Reduce spread of leptospirosis and reduce abortions and baby pig mortality	Sole medication	14 days		
Ethylenediamine dihydriodide	200-500gm/ head/day	Aid in removal of mucus from respiratory tract		7 days		Treat with caution due to individual variation in response to effects of iodides
Furazolidone	150[a]	Prevent bacterial scours in baby pigs	Sows	1 week before farrowing and 2 weeks after farrowing		
	100-200[a]	Prevent bacterial enteritis; vibrionic dysentery; for growth promotion		100gm/ ton-5 weeks; or 150gm/ ton-3 weeks; or 200gm/ ton-2 weeks		

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Furazolidone (continued)	300[a]	Treat bacterial enteritis, and vibrionic dysentery; growth promotion		10-14 days		
Hygromycin B	12[a]	Control large roundworms, nodular worms, and whipworms			Discontinue 48 hours before slaughter	
Neomycin	35[a]	Prevent bacterial enteritis				
	70-140[a]	Treat bacterial enteritis				
Nitrofurazone	500[a]	Treat necrotic enteritis due to Salmonella		5-7 days		
3-nitro-4-hydroxy-phenyl arsonic acid	22.7-45.4[a]	Growth promotion			Discontinue 5 days before slaughter	
Nystatin	20[a]	Growth promotion				
Oxytetracycline	25-50[a]	Growth promotion	Swine 10-30 lbs.			
	7.5-10[a]	Growth promotion	Swine 30-200 lbs.			
	50[a]	Aid in prevention of bacterial enteritis				
	100[a]	Aid in treatment of bacterial enteritis				
	50-150[a]	Aid in maintaining weight in presence of atrophic rhinitis				
	500[a]	Reduce abortions in presence of leptospirosis		Feed 7-14 days one month prior to farrowing		
Procaine penicillin	10-50[a]	Growth promotion				
Phenothiazine	5gm up to 25 lb. body wt. 8gm for 26-50 lb. body wt. 10gm per 100 lb. body wt.	Remove nodular worms		1 treatment only		Do not exceed 30gm. Sick or weak animals should not be treated except upon advice of a veterinarian. Do not administer to pregnant animals during last 4 weeks of pregnancy.
Phthalylsulfacetamide	0.1 lb./50 lb. body wt/ day	Treat bacterial enteritis		3-5 days		
Piperazine	5gm/100 lb. body wt.	Control large roundworms and nodular worms		Treat 1-2 days		
Sulfaquinoxalone	227-450[a]	Control bacterial enteritis		2-5 days		
Tylosin	1.0-4.0gm/lb. body wt.	Treat erysipelas, pneumonia, vibronic dysentery, PPLO arthritis	Swine—intramuscular injection	3 days	Discontinue 4 days before slaughter	
	0.25-1.0gm/gal.[b]	Treat vibronic dysentery		10 days	Discontinue 48 hours before slaughter	
	10-100[a]	Growth promotion				
	40-100[a]	Prevent vibronic dysentery				

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

Table 3. Poultry Feed Additives and Drugs

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
2-Acetylamino-5-Nitrothiazole	0.015%	Prevent blackhead	Turkeys		Withdraw 7 days before slaughter	
2-Amino-5-Nitrothiazole	0.112%	Control blackhead	Turkeys	14 days	Discontinue 7 days before slaughter	
Amprolium	113.5-227[a]	Prevent coccidiosis	Turkeys			
		Prevent coccidiosis	Broiler chickens			Do not feed to laying hens
	36.3-113.5[a]	Coccidiosis immunity	Replacement chickens			Do not feed to laying hens
	0 006%-0.024%	Treat coccidiosis	Chickens			Do not feed to laying hens
Arsanilic acid	45-90[a]	Growth promotion, improve pigmentation	Chickens, turkeys		Discontinue 5 days before slaughter	
Arsenosobenzene	0.002%	Prevent coccidiosis	Chickens		Discontinue 5 days before slaughter	
Sodium arsanilate	45-90[a]	Growth promotion, improve pigmentation	Chickens, turkeys		Discontinue 5 days before slaughter	
Bacitracin	4-50[a]	Growth promotion	Chickens, turkeys, pheasants			
	5-20[a]	Growth promotion	Quail not over 5 weeks of age			
Zinc bacitracin	4-50[a]	Growth promotion	Chickens, turkeys, pheasants			
	5-20[a]	Growth promotion	Quail not over 5 weeks of age			
	10-50[a]	Maintain egg production	Laying hens			
	50-100[a]	Prevent CRD and blue comb	Chickens			
	50-100[a]	Prevent inf. sinusitis and blue comb	Turkeys			
	100[a]	Maintain egg hatchability, stress	Chickens			
	100-500[a]	Treat CRD and blue comb	Chickens			
	100-500[a]	Treat inf. sinusitis and blue comb	Turkeys			
Bacitracin methylene disalicylate	4-50[a]	Growth promotion	Chickens, turkeys,			
	10-50[a]	Maintain or increase egg production	Chickens			
	50-100[a]	Prevent CRD blue comb	Chickens			
	50-100[a]	Prevent inf. sinusitis, blue comb	Turkeys			
	100[a]	Increase hatchability of eggs	Laying hens			
		Prevent early mortality of chicks	Chicks			
	100-200[a]	Treat CRD, blue comb	Chickens			
	100-200[a]	Treat inf. sinusitis, blue comb	Turkeys			
Manganese bacitracin	4-50[a]	Growth promotion	Chickens, turkeys,			
	5-20[a]	Growth promotion	Quail not over 5 weeks of age			

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Bithionol, combined with methiotriazamine	454[a] and 90.8[a]	Prevent coccidiosis, reduce tapeworm and large roundworms	Chickens		5 days prior to slaughter	Not to be fed to laying chickens
2-chloro-4-nitrobenzamide plus **acetyl (p-nitro-phenyl)-sulfanilamide**	227[a] 181.6[a]	Prevent coccidiosis	Chickens		Withdraw 4 days before slaughter	Not to be fed to laying chickens
Chlortetracycline	10-50[a]	Growth promotion	Chickens, turkeys			
	50-100[a]	Decrease mortality	Chicks			
		Increase hatchability and egg production	Laying hens			
		Prevent inf. sinusitis, blackhead	Turkeys			
Dibutyltin dilaurate	0.037%	Prevent coccidiosis and hexamitiasis	Turkeys		Discontinue 7 days before slaughter	
Dienestrol diacetate	20.9[a]	Promote distribution of fat for tenderness and bloom	Broiler chickens at 5-6 weeks of age	4-6 weeks	Discontinue 48 hours before slaughter	
	20.9[a]	Promote distribution of fat for tenderness and bloom	Roasting chickens at 5-6 weeks of age	6-10 weeks	Discontinue 48 hours before slaughter	
	31.8[a]	Promote distribution of fat for tenderness and bloom	Roasting chickens 8-9 weeks of age	5-7 weeks	Discontinue 48 hours before slaughter	
	63.6[a]	Promote distribution of fat for tenderness and bloom	Broiler chickens at 3 weeks of age	3 weeks	Discontinue 48 hours before slaughter	
	63.6[a]	Promote distribution of fat for tenderness and bloom	Turkey broilers at 8-10 weeks of age	3 weeks	Discontinue 48 hours before slaughter	
Dimetridazole	136-182[a]	Prevention of blackhead	Turkeys		Withdraw 5 days before slaughter	Eggs not to be used for food purposes
	544-725[a]	Aid in control of blackhead	Turkeys	7 days	Withdraw 5 days before slaughter	Eggs not to be used for food purposes
	0.01%[b]	Prevent blackhead	Turkeys as sole source of drinking water		Discontinue 3 days before slaughter	Not to be fed to laying birds
	0.02%[b]	Treatment of blackhead	Turkeys as sole source of drinking water		Discontinue 3 days before slaughter	Not to be fed to laying birds
	0.04%[b]	Treat severe outbreak of blackhead	Turkeys as sole source of drinking water	5 days	Discontinue 5 days before slaughter	Not to be fed to laying birds
3, 5 Dinitrobenzamide	680[a]	Prevent fowl typhoid, paratyphoid and pullorum	Chickens	14 days	Discontinue 2 days before slaughter	Not to be fed to laying chickens
	1360[a]	Treatment of fowl typhoid, paratyphoid and pullorum	Chickens	10 days	Discontinue 2 days before slaughter	Not to be fed to laying chickens
3, 5 Dinitrobenzamide plus **acetyl (p-nitrophenyl) sulfanilamide**	227[a] 272[a]	Prevent coccidiosis	Chickens		Discontinue 5 days before slaughter	Not to be fed to laying chickens

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INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Erythromycin	4.6-18.5[a]	Growth promotion	Growing chickens			
	92.5[a]	Prevent CRD	Chickens	8 days		
	185[a]	Treat CRD, blue comb, inf. sinusitis	Chickens	8 days		Eggs not to be used for food purposes during treatment period
Ethylene-diamine dihydriodide	113.4[a]	Aid in removal of mucus from respiratory tract	Chickens, turkeys	5-7 days		Treat with caution because of variation in response to effects of iodides
Estradiol monopal-mitate	10mg/dose pellet implant	Produce uniform fat distribution, improve finish	Roasting chic-kens; one dose/ bird at base of skull at not less than 5 weeks of age		Not to be used within 6 weeks of slaughter	
Furazolidone	7.5-10[a]	Growth promotion	Chickens, turkeys			
	25[a]	Increase egg production	Chickens			
	50[a]	Prevent coccidiosis in chickens, fowl typhoid, paraty-phoid and pullorum in chickens and turkeys	Chickens, turkeys	Fed con-tinuously in birds older than 2 weeks of age		
	100[a]	Prevent fowl typhoid, paratyphoid and pullorum	Chickens, turkeys	Fed at 100mg/ton for first two weeks of life followed thereafter by 50gm/ ton		
		For prevention of blackhead, inf. hepatitis	Chickens, turkeys			
		Control coccidiosis	Chickens	Fed for 5-7 days fol-lowed by 50gm/ton for two weeks		
	100[a]	Aid in control of CRD, infectious sinusitis, bluecomb	Chickens, turkeys			
	200[a]	Treatment of para-typhoid, blackhead, and paracolon	Chickens, turkeys			
		Treatment of hexamitiasis	Turkeys			
		Control CRD, inf. sinusitis and bluecomb	Chickens, turkeys	Fed at 200gm/ton for 5-10 days followed by 50gm/ton		
Hygromycin B	8-12[a]	Control large round worms, cecal worms and capillary worms	Chickens			
Neomycin	35[a]	Prevent bacterial enteritis	Chickens, turkeys, ducks			
	70-140[a]	Treat bacterial enteritis	Chickens, turkeys, ducks			
Nicarbazin	10-20[a]	Prevent coccidiosis	Chickens		Discontinue 4 days before slaughter	Do not feed to laying chickens

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Nihydrazone	100[a]	Prevent CRD, pullorum fowl typhoid, coccidiosis and blackhead; reduce mortality in presence of CRD	Broilers and replacement chickens not over 14 weeks of age			Not for laying chickens
Nithiazide	113.5-363[a]	Prevent blackhead and hexamitiasis (turkeys)	Chickens, turkeys		Discontinue 24 hours before slaughter	Not to be fed to laying chickens
Nitrofurazone	50[a]	Prevent coccidiosis	Chickens, turkeys			
	100[a]	Control coccidiosis	Chickens	Fed for 5-7 days at 100gm/ton followed by 50gm/ton thereafter		
	150[a]	Prevent mortality due to pullorum	Chickens	Fed 10-14 days at 150gm/ton followed by 50gm/ton thereafter		
3-nitro-4-hydroxy-phenyl arsonic acid	22.7-45.4[a]	Growth promotion, improve pigmentation	Chickens, turkeys		Discontinue 5 days before slaughter	
Nitrophenide	113.6-227[a]	Prevent coccidiosis	Chickens			
	450[a]	Control coccidiosis	Chickens			
4-nitrophenyl arsonic acid	170[a]	Prevent blackhead	Chickens		Discontinue 5 days before slaughter	Dangerous for ducks, geese and dogs
	227[a]	Prevent blackhead	Turkeys		Discontinue 5 days before slaughter	
Novobiocin	200[a]	Treat cutaneous staph. infection	Chickens	5-7 days	Discontinue 4 days prior to slaughter	Not for laying chickens
	200[a]	Treat cutaneous staph. infection	Turkeys	5-7 days	Discontinue 4 days prior to slaughter	Not for laying chickens
	350[a]	Treat staph. infections	Chickens	5-7 days	Discontinue 4 days prior to slaughter	Not for laying chickens
	350[a]	Treat staph. infections	Turkeys	5-7 days	Discontinue 4 days prior to slaughter	Not for laying chickens
Nystatin	50[a]	Prevent crop mycoses and mycotic diarrhea	Growing chickens, laying chickens, growing turkeys			
	100[a]	Treat crop mycoses and mycotic diarrhea	Laying chickens, growing turkeys	7-10 days		
Oleandomycin	1-2[a]	Growth promotion	Chickens			Not to be fed to laying chickens

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INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Oxytetracycline (as monoalkyltrimethyl ammonium salt)	50[a]	Prevent disease during stress	Chickens, turkeys			
	50-100[a]	Prevent bluecomb	Chickens			
	50-100[a]	Prevent hexamitiasis	Turkeys			
	50-100[a]	Prevent mortality	Chicks			
	100-200[a]	Control inf. sinusitis, bluecomb, prevent inf. synovitis, treat hexamitiasis	Turkeys			
	100-200[a]	Prevent fowl cholera and control CRD	Chickens			
	100-200[a]	Treat bluecomb, prevent inf. synovitis, control CRD	Chickens in low calcium feed during first 10 weeks of life (0.18-0.55% calcium)	5 days at a time for a total of three 5 day periods separated by 5 days of non-treated feed		Not to be fed to laying chickens
	200[a]	Prevent inf. hepatitis and coccidiosis	Chickens in low calcium feed during first 10 weeks of life (0.18-0.55% calcium)	2 weeks		Not to be fed to laying chickens
	200[a]	Control inf. synovitis	Chickens			
Oxytetracycline (as quaternary salt of oxytetracycline)	100-200[a]	Treat bluecomb, prevent inf. synovitis, control CRD	Chickens in low calcium feed (0.18-0.55% calcium)	Feed low calcium feed for 5 day period interrupted by 5 days of normal calcium feed for first 10 weeks of life		Not to be fed to laying chickens
	200[a]	Control fowl cholera	Chickens	2 weeks, 5 days of low calcium and remainder on normal calcium feed		Not to be fed to laying chickens
Phenothiazine	0.5gm/bird	Remove cecal worms	Chickens	1 treatment only		
	1gm/bird	Remove cecal worms	Turkeys	1 treatment only		
Procaine penicillin	2.4-50[a]	Growth promotion	Chickens, turkeys and pheasants			
	5-20[a]	Growth promotion	Quail, not over 5 weeks of age			
	50-100[a]	Prevent or treat CRD and bluecomb	Chickens			
Phthalylsulfacetamide	1134-2268[a]	Treat non-specific bacterial enteritis	Chickens, turkeys	Fed for 5-7 days		
Piperazine	50mg/bird	Control large roundworms	Chickens, turkeys (under 6 weeks of age)	Treat 1 day only		
	100mg/bird	Control large roundworms	Chickens, turkeys (over 6 weeks of age)	Treat for 2 days		

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INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Reserpine	0.182[a]	Prevent aortic rupture	Turkeys over 4 weeks of age			
	0.908[a]	Prevent aortic rupture	Turkeys over 4 weeks of age	5 days		
	0.908[a]	Stress	Broilers			
	1.82[a]	Stress	Laying hens			
Sulfaquin-oxalone	45.4-227[a]	Prevent coccidiosis	Chickens			
	227-900[a]	Control coccidiosis	Chickens			
	900[a]	Control acute fowl cholera	Chickens, turkeys			
	160[a]	Prevent coccidiosis	Turkeys			
	450	Control coccidiosis				
Tylosin	6.25-12.5mg/ sinus	Treat inf. sinusitis	Turkeys		Do not treat 5 days prior to slaughter	
	2-5gm/gal.[b]	Treat CRD	Chickens	5 days	Discontinue 24 hours prior to slaughter	Not for laying chickens
	2gm/gal.[b]	Maintain weight in presence of inf. sinusitis	Turkeys	5 days		
Tylosin phosphate	4-50[a]	Growth promotion	Chickens			
P-ureido benzenear-sonic acid	450-900[a]	Control blackhead	Chickens		Discontinue 5 days before slaughter	
Zoalene	36.3-113.5[a]	Coccidiosis	Replacement chickens; in complete feed only; not to be fed to birds over 14 weeks of age			Not to be fed to laying birds
	113.5[a]	Coccidiosis	Broiler chickens			Not to be fed to laying birds
	113.5-170.3[a]	Coccidiosis	Turkeys grown for meat purposes only			Not to be fed to laying birds

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

Table 4. Feed Additives for Sheep, Horses and Other Animals

INGREDIENT	QUANTITY	USE	LIMITATIONS	AUTHORIZED TREATMENT PERIOD	WITHDRAWAL PERIOD	SPECIAL PRECAUTIONS
Chlortetracycline	20-50[a]	Growth promotion	Lambs, growing sheep, mink			
	50[a]	Prevent bacterial diarrhea	Lambs			
	100[a]	Treat bacterial diarrhea	Lambs			
	25mg/head/day	Reduce losses due to enterotoxemia	Sheep			
	80mg/head/day	Aid in reducing vibrionic abortion	Sheep			Feed continuously during pregnancy
	85mg/head/day	Growth promotion	Horses up to 1 year of age			Not to be used for food purposes
Diethylcarbamazine	0.0066%	Control large roundworms	Dogs			
Diethylstilbestrol	2mg/day	Growth promotion	Sheep		48 hours prior to slaughter	Do not feed to breeding animals
Neomycin	35[a]	Prevent bacterial enteritis	Sheep, goats, horses			
	70-140[a]	Treat bacterial enteritis	Sheep, goats, horses			
	100-200mg/gal. milk replacer	Prevent bacterial enteritis	Lambs, kids, foals			
	200-400mg/gal. milk replacer	Treat bacterial enteritis	Lambs, kids, foals			
Nitrofurazone	100-200[a]	Treat gray diarrhea	Mink, discard unused feed every 24 hours	24 days		
	100	Control gray diarrhea	Mink, discard unused feed every 24 hours	90 days		
Phenothiazine	1gm/head/day	Prevent parasitism	Sheep, goats			Do not feed to lactating dairy animals
	12.5mg. under 60 lb. body wt. 25gm. over 60 lb. body wt.	Remove parasites	Sheep, goats	1 treatment only		
	2gm/head/day	Prevent parasitism	Horses, mules	Administer for 21 days of each month		Do not give to sick or weak animals except on advice of a veterinarian.
	3gm/100 lb. body wt. Do not exceed 60gm	Remove strongyle worms	Horses, mules			Do not give during last 4 weeks of pregnancy
Progesterone combined with estradiol benzoate	25mg 2.5mg Subcutaneous ear implantation	Growth promotion	Lambs 60-85 lb.	1 dose	Do not use within 60 days of slaughter	
Promazine	0.75-1.25mg/lb. body wt.	Tranquilizer	Horses		72 hours prior to slaughter	
Sulfaquinoxalone	227-450[a]	Control dysentery and coccidiosis	Lambs			
Medroxyprogesterone acetate	50-100mg/head/day	Synchronize estrus and ovulation	Breeding ewes	14-21 days		

CODE: a = Gm/ton of feed b = drinking water c = feed concentrate d = block or granular concentrate

Table 5. Drugs or Antibiotics That Require an Approved NDA or Antibiotic Form 10*

2-acetylamino-5-nitrothiazole

Acetyl-(para-nitrophenyl)-sulfanilamide

Amprolium—not required if complete feed prepared from a feed additive concentrate containing not more than 0.05% amprolium

Arsenosobenzene

Bithionol and methiotriazamine

2-chloro-4-nitro-benzamide

Dienestrol Diacetate

Diethylstilbestrol

Dimetridazole

3,5 Dinitrobenzamide

Hygromycin B—not required if complete poultry feed prepared from a feed additive concentrate containing not more than 32 gm. Hygromycin B per ton. Not required in swine feed.

Medroxyprogesterone acetate

Nihydrazone

Novobiocin

Oleandomycin

Reserpine—not required if complete feed made from feed additive concentrate containing not more than 0.004% reserpine per ton.

Ronnel

Thiabendazole

Tylosin—(a) Poultry—not required if complete feed made from feed additive concentrate containing not more than 200 gm. tylosin per ton.
(b) Swine—not required if complete feed made from feed additive concentrate containing not more than 500 gm. tylosin per ton

P-Ureidobenzenearsonic acid

Zoalene—not required if complete feed made from a feed additive concentrate containing not more than 0.0375% zoalene

* **New claims for uses of drugs other than those listed, or combinations of drugs, may require an approved NDA or Antibiotic Form 10.**

Table 6. Conversion Factors

Convert	Into	Method	Example
gram (g)	kilogram (kg)	move decimal point 3 places to left	330g = 0.33kg
gram (g)	milligram (mg)	move decimal point 3 places to right	1.4g = 1400mg
gram (g)	pound (lb)	divide by 454	$1816g = \frac{1816}{454} = 4.0$ lb
gram/ton	per cent	multiply by 11 and move decimal point 5 places to left	113g/ton = 11x13 = 1243 or 0.01243%
milligram (mg)	gram (g)	move decimal point 3 places to left	275mg = 0.275g
milligram/gallon	per cent	move decimal point 3 places to left and divide by 37.85	$100mg/gal = \frac{.100}{37.85} = .0026\%$
per cent	p.p.m.	move decimal point 4 places to right	0.01% = 100 ppm
per cent	grams/ton	divide by 11 and move decimal point 5 places to right	0.01243% = 113g/ton
per cent	milligrams/gallon	move decimal point 3 places to right and multiply by 37.85	.0026% = 2.6x37.85 = 98.4mg/gal
pound (lb)	grams (g)	multiply by 454	2 lb = 908g
p.p.m.	per cent	move decimal point 4 places to left	100ppm = 0.01%

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Methods for Avoiding Illegal Drug Residues

1. Correctly identify and store all medicated feeds.
2. Do not permit feeds to become accidentally contaminated with drugs, pesticides, or other chemicals.
3. Read Feed Labels completely and follow feeding instructions exactly. Do not throw away label from opened or partially used containers.
4. Use medicated feeds only for purposes and species of animal indicated on the label.
5. Never mix a drug or chemical into a feed unless so authorized under State and Federal law.
6. Do not combine two or more drugs in a complete feed unless the use of the combined materials is approved by State and Federal laws.
7. Heed all warning statements on the label and comply strictly with withdrawal requirements before slaughter.